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A COMPARISON OF THE GUINEA-PIG AND CAT METHODS FOR THE PHYSIOLOGICAL STANDARDIZATION OF ACONITE PREPARATIONS.

By J. C. Ford, C. P. S. Ford and J. E. Wine.

For some time it has been felt that the chemical method for the assay of aconite is not satisfactory. Anselmino states [1] that the German Pharmacopœia does not require that aconite conform to a chemical standard, since the activity of the drug seems entirely independent of the alkaloidal content. Roth believes [2] that "the chemical method of assay required by the U. S. P. for *Aconitum Napellus* is not a measure of its activity. A preparation relatively rich in total alkaloids may have a low toxicity, and *vice versa*." Stevens, on the contrary, is of the opinion that the chemical method, while not absolutely accurate, is of some value.

In view of the unreliability of the chemical methods, it is of interest to see what has been accomplished in the way of the physiological standardization of aconite.

The first method introduced for the physiological standardization of aconite preparations was that used by Dr. Squibb, and is known as the "Squibb" or "Taste" method. In the performance of this test, the mouth of the operator is rinsed with distilled water, and four cubic centimetres of the required dilution of the preparation to be assayed is held in the anterior part of the mouth for exactly one minute. After several minutes, a distinct aconite "impression" is made. The mucous membrane should not tingle, but a sensation suggestive of tingling should be produced. A fresh fluidextract should bring about the reaction in a dilution of one to six hundred.

The frog method, used by at least one of the large manufacturers, is based upon the killing power of the preparation for frogs. The

animals should always be of the same species, and care must be taken to have all conditions the same in different assays.

The preparation to be tested is reduced in its alcoholic content and the calculated dose injected into the ventral lymph-sac. The animals are observed at the end of twenty-four hours and note made as to those that survive and those that succumb.

In the guinea-pig method, as used by Roth, the dose is calculated per gramme body weight and the solution, reduced in its alcoholic content, is injected beneath the skin of the abdomen.[2] In Hatcher's method, cats are used, and the properly diluted and isotonic solution is injected intravenously over an extended period of time until the death of the animal occurs. The method is essentially the same as the cat method for the assay of the digitalis bodies.

Roth's paper [2] contains a report of his studies on the various physiological methods, with the exception of Hatcher's. We have recently carried out tests on five commercial samples of tincture of aconite with a view of gaining information on the following points:

1. The agreement in the results secured by the different physiological methods.

2. The quality of aconite on the local market.

The second point is of particular importance in Richmond, on account of the rather extensive employment of aconite in spite of its questionable therapeutic value. The features of the investigation bearing on this point have been published in another paper,[4] and we shall here confine ourselves to a discussion of the methods of assay used.

Of the five samples used in our investigation, three were percolated by the local pharmacists from drugs that they had purchased; the other two were manufactured by two of the large manufacturers. Of the latter two samples, one was supposed to have been tested physiologically, the other by the chemical method.

There are, on theoretical grounds, several objections to the taste method. It would seem that the susceptibility of the individual observer is apt to vary considerably; that imagination plays an important rôle in producing the aconite "impression"; and there is the added objection that there is no definite record made, such as the graphic record secured in the blood-pressure method in testing adrenalin. Consequently, we undertook tests with this method in a somewhat prejudiced frame of mind, which may partly account for the unsatisfactory results. However that may be, in our hands the

method was found absolutely unreliable. Our experience with the frog method was similar. It was found difficult to interpret results, and we can agree with Roth that this method has little to recommend it.

After the elimination of these two methods, we have left only the guinea-pig and the cat methods. Both of these are lethal dose methods, which is not an objectionable feature in regard to a drug like aconite. The technic of the guinea-pig test is undoubtedly simpler than that of the cat method, but we can agree with Dr. Hatcher that anyone can easily acquire the operative skill necessary for the performance of this latter test.

Hatcher's method is cheaper than the guinea-pig method, so far as cost of animals is concerned, and possesses the decided advantage of rapidly yielding results. In his earlier paper, Dr. Hatcher was not enthusiastic over the use of the cat method for aconite, but later work seems to have given better results.*

In testing our samples on guinea-pigs, the tinctures were evaporated on a water-bath to one-half their original volume and diluted with saline to twice the original volume. The dose was calculated per gramme body weight and the injections made subcutaneously with a one cubic centimetre glass tuberculin syringe, except when the dose was too large, when a 5 c.c. Record syringe was used. The following are the results:

TABLE I.

Doses are given in Fractions of a Cubic Centimetre of Official Tincture per Gramme Body Weight. Survived −; died +.

Tincture A	Tincture B	Tincture C	Tincture D	Tincture E
0.0003 −	0.0003 −	0.0019 −	0.00085 −	0.0008 −
0.0004 −	0.0004 −	0.0021 +	0.00093 +	0.0009 −
0.0010 −	0.0010 −	0.0023 +	0.0010 +	0.0010 +
0.0015 −	0.0015 −	0.0029 +	0.00130 +	0.0011 +
0.0024 −	0.0030 −			0.0013 +
0.0027 +	0.0037 −			
0.0030 +	0.0046 −			
	0.0057 −			
	0.0072 +			

Only four samples were tested on cats. The method of procedure was to dilute the tinctures in the proportion of one to ten and add salt to make an isotonic solution. The injections were made into the

* Personal communication.

femoral or saphenous vein, and the basis we went on was that ten cubic centimetres per kilogramme body weight should be injected in thirty minutes. The following results were secured:

TABLE II.

Doses are Given in Fractions of a Cubic Centimetre per Gramme Body Weight to Facilitate Comparison with the Guinea-pig Figures.

Cat	Tincture A	Tincture C	Tincture D	Tincture E
1	0.00109	0.00106	0.00052	0.00058
2	0.00095	0.00120	0.00044	0.00066
3	0.00086	0.00115	0.00046	0.00076
4	0.00040	0.00060	0.00039	
5	0.00057			

At first glance the figures for some of the samples are not encouraging. Thus, we see that one cat succumbed to a dose of Tincture A, less than half that required by another animal. When, however, exceptional animals are ruled out, as cats 4 and 5 Tincture A, it is evident that little variation in the dose required occurs.

The results secured by the two methods of assay may be compared in Table III.

TABLE III.

Tinctures	Tincture A	Tincture C	Tincture D	Tincture E
Guinea-pig method	0.0027	0.0021	0.00093	0.0010
Cat method	0.00086	0.00113	0.00045	0.00066

We believe, as the result of our experiments and the experience of others, that the following conclusions may be drawn:

1. The chemical method of assay for aconite is unreliable.

2. That the taste and frog methods for the physiological testing of aconite have little to recommend them.

3. That the guinea-pig method and the cat method give results that are fairly concordant.

We desire to express our obligation to Dr. Charles C. Haskell for assistance in and supervision of this work.

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[2] *Jour. of the Am. Ph. Assoc.*, vol. 2, 1913.
[3] AM. JOUR. PHAR., August, 1910.
[4] *Old Dominion J. Med. and Surg.*, XX, 6, p. 339 (1915).

THE BOTANICAL SOURCE, PHYSICAL CHARACTERS, AND CHEMICAL CONSTITUENTS OF CHAULMOOGRA OIL.

By Frederick B. Power.

In the October number of this Journal (pp. 473–483) there appeared a paper by Mr. Probodha C. Chattopadhyay, of Calcutta, India, entitled: "The Examination of Chaulmoogra Oil." The paper referred to contains so many obviously incorrect statements and such completely unwarranted inferences or conclusions that, in view of the confusion which is thus likely to be produced in the literature of the subject, it has been considered that some comment upon it should not be withheld. It may be stated at the outset that the task of reviewing a paper of this character, and of presenting such criticisms respecting it as are deemed necessary, is not an inspiriting one, for it was reasonably to be assumed that the botanical source, physical characters, and chemical composition of chaulmoogra oil had been thoroughly established and were well known to all who are conversant with recent chemical or pharmaceutical literature. Inasmuch as the present author and his colleagues of the Wellcome Chemical Research Laboratories, London, had devoted several years to the study of chaulmoogra oil and several more or less closely related products, with the use of absolutely authentic material, together with the fact that the results of these researches had all been published in the *Journal of the Chemical Society*[1] of London, and widely abstracted in other periodicals, no further justification would appear to be needed for the remarks which are here presented.

The above-mentioned series of investigations have indeed been referred to by Mr.Chattopadhyay and partially cited in his paper, and the respective original publications were doubtless available to him. It is, therefore, all the more astonishing that he should have given expression to such completely erroneous views, and especially to have made such unfounded and illogical statements respecting the composition of chaulmoogra oil. Although a detailed consideration of the subject-matter of the paper referred to would serve no useful purpose, it nevertheless seems important that notice should

[1] *Journ. Chem. Soc.*, 1904, **85**, pp. 838–861; 1905, **87**, pp. 349–357, 884–900; 1907, **91**, pp. 557–578; 1910, **97**, pp. 1285–1289.

be taken of some of the statements which concern fundamental and established facts.

Mr. Chattopadhyay begins his communication (*loc cit.*, p. 473) by stating that "Chaulmoogra oil of commerce is obtained from a large variety of seeds," although subsequently noting that Colonel Prain,[2] who was formerly Director of the Botanic Survey of India, but for several years past has been Director of the Royal Botanic Gardens at Kew, "proved that the oil is really obtained from the seeds of *Taraktogenos Kurzii*, King, a native of Burmah." It is furthermore stated, however, that "the commercial oil is also made from *false* chaulmoogra seeds, botanically known as *Gynocardia odorata*, or more correctly, *Chaulmoogra odorata*, which grows abundantly in Chittagong and Assam," and that "the chaulmoogra seeds bought from various shopkeepers in the local market (*i.e.*, presumably Calcutta) were examined and all of them were found to be *Gynocardia odorata*." Samples of the oil examined by Mr. Chattopadhyay were obtained by him from two different firms in Calcutta, one of the products being described as of "a pale, brownish-yellow color, of the consistency of butter," while the other was "an oil of a pale sherry color, *is liquid at ordinary temperatures, and remains so even at 15° C.*"

For the purpose of comment, the following additional statements in Mr. Chattopadhyay's paper may be literally quoted:

"All European observers describe genuine chaulmoogra oil as a soft solid of varying consistency (melting-point 22–23° C.). Indeed, Dr. Power and Mr. M. Barrowcliff,[3] in their paper on the examination of the oil of *Gynocardia odorata*, remark that the oil of Gynocardia seeds is a liquid, whereas the chaulmoogra oil of commerce (*i.e.*, that made from taraktogenos seeds) is a solid. The above botanical notes show that the matter is in an unsatisfactory condition as to the exact source of chaulmoogra oil. The various analyses by different observers support this view. In my opinion, the oil of genuine taraktogenos seeds expressed by cold process is *liquid* at ordinary temperatures, and the oil obtained by hot expression of these seeds is solid or semi-solid, whereas the oil from Gynocardia seeds is probably semi-solid, whether obtained by cold or hot process. These observations I will confirm as soon as I get the genuine seeds."

[2] Now Sir David Prain, F.R.S.

[3] *Journ. Chem. Soc.*, 1905, **87**, p. 897.

From the incompleteness of the observations recorded by Mr. Chattopadhyay, there can be little doubt but that he has himself contributed very considerably to the unsatisfactory condition which he believes to exist respecting the exact source of chaulmoogra oil. If any serious consideration were to be given to the deductions he has made respecting the chemical constituents of the oil, no greater confusion of a subject could possibly be produced.

With regard to the physical characters of what may be designated *genuine* chaulmoogra oil, as obtained from the seeds of *Taraktogenos Kurzii,* King, the fact may again be recorded that the oil employed by the present author and his associates for their investigations was obtained directly from true, freshly-collected *Taraktogenos* seeds, conforming to the description given by Lieutenant-Colonel Prain,[4] and their authenticity was furthermore established by Mr. E. M. Holmes, F. L. S. of London. The expression of the oil from these seeds, of which several hundredweight were employed, was most carefully conducted by Messrs. Stafford Allen & Sons, of London, by the use of strong hydraulic pressure. These facts should certainly suffice to eliminate any question of doubt respecting the genuineness of the chaulmoogra oil described and employed by us. In its physical characters it also agreed closely with such of the products then available in the London market as were represented to be true chaulmoogra oil, all of which at the ordinary temperature were soft solids. It is therefore believed that the description of chaulmoogra oil, as given in the British Pharmacopœia of 1914, which is certainly authoritative, is also perfectly correct, although the so-called physical constants are naturally there given within certain limits, while the figures observed for the particular lot of oil expressed for us were recorded[5] as follows: Melting-point 22–23° C.; specific gravity 0.951 at 25° and 0.940 at 45° C., $[\alpha]_D^{15°}$ + 52.0°; acid value 23.9; saponification value 213.0; iodine value 103.2.

The British Pharmacopœia of 1914 defines chaulmoogra oil as "the fatty oil expressed from the seeds of *Taraktogenos Kurzii,* King," and assigns to it the following characters and tests: "A brownish-yellow oil or soft fat. Characteristic odor; taste somewhat acrid. Melting-point, about 22 to 30°. Specific gravity at

[4] Compare *Pharm. Journ.,* London, 1900, **64,** p. 522, and 1901, **66,** p. 596.
[5] *Journ. Chem. Soc.,* 1904, **85,** p. 843.

45°, about 0.940; saponification value, 198 to 213; iodine value, 96 to 104; acid value, 21 to 27."

From the above-noted melting-point (22–30° C. or 71.6–86° F.) it is evident that, at what may be regarded as ordinary atmospheric temperatures, chaulmoogra oil would be a soft solid, although Mr. Chattopadhyay has stated that one of the samples of oil examined by him was liquid and remained so, even at 15° C.

The oils expressed from perfectly authenticated seeds of *Hydnocarpus Wightiana,* Blume, and *Hydnocarpus anthelmintica,* Pierre, which were also subjected to a complete chemical examination by the present author and his associates,[6] were found to resemble chaulmoogra oil very closely, both in their physical characters and chemical composition. Their medicinal properties would therefore doubtless be very similar to those of the oil obtained from *Taraktogenos* seeds. In this connection it would appear of interest to recall the fact that a few years ago several cases of poisoning occurred in Germany through the use of margarine prepared from so-called "cardamon oil" or "maratti fat," which had been imported from India. By means of the above-mentioned investigations it was ascertained that this fat agreed in its characters with that obtained from *Hydnocarpus* seeds, and its identification as such was readily confirmed by the isolation of the crystalline, optically active chaulmoogric acid, $C_{18}H_{32}O_2$ (melting-point 68° C.), to which further reference will subsequently be made.

The statement of Mr. Chattopadhyay (*loc. cit.,* p. 474) that "the chaulmoogra seeds bought from various shopkeepers in the local market (Calcutta) were examined and all of them found to be *Gynocardia odorata,*" taken in conjunction with his expressed opinion (*loc. cit.,* p. 475) that "the oil from Gynocardia seeds is probably semi-solid, whether obtained by hot or cold process," would appear to render it very doubtful whether the seeds referred to by him were really those of *Gynocardia odorata.* The doubt respecting their proper identification is justified and sustained by the following facts. Inasmuch as the seeds of *Gynocardia odorata* had long been considered to be the source of chaulmoogra oil, it was deemed desirable by the present author and his associates, after the complete investigation of *Taraktogenos* oil, also to examine the oil from authentic *Gynocardia* seeds. In order to obtain the latter, application was made to Dr. David Hooper, who was at that time curator of the

[6] *Journ. Chem. Soc.,* 1905, **87**, pp. 884–896.

Indian Museum in Calcutta, but as these seeds were not an article of commerce in India, considerable difficulty was experienced in procuring them. Through the kind interest of Dr. Hooper, however, a sufficient quantity was specially collected for us in Sylhet, Assam. The genuineness of the seeds was first confirmed by Surgeon-Major Prain, Director of the Botanic Survey of India, and subsequently by Mr. E. M. Holmes, F. L. S., of London. The expression of the oil was most carefully conducted by Messrs. Stafford Allen & Sons, of London, and it was this absolutely authentic material which was employed by the present author and his associates for the chemical investigation.[7] The oil so obtained, as originally described by us, was, at the ordinary temperatures, a pale yellow liquid, having an odor resembling that of linseed oil. It retained its fluidity after keeping for several years, and even on exposure to temperatures below 15° C. The so-called physical constants found for the oil were as follows: Specific gravity at 25° C., 0.925; acid value, 4.90; saponification value, 197.0; iodine value, 152.8

Mr. Chattopadhyay has devoted considerable space in his paper (*loc. cit.*, p. 482) to a description of what he has termed "Salts of Gynocardic Acid," the name "gynocardic acid" having been originally given by Moss[8] to a product obtained from chaulmoogra oil, but which evidently consisted of a mixture of acids. Petit[9] subsequently published a method for the preparation of the so-called "gynocardic acid" from chaulmoogra oil, and appears to have comprehended under this name that portion of the total fatty acids which is soluble in 70 per cent. alcohol at 15° C. and has a melting-point of 29° C.

Mr. Chattopadhyay states to have prepared the above-mentioned "salts of gynocardic acid," namely, those of calcium, zinc, and magnesium, "by neutralizing the oil with alcoholic potash and precipitating the neutralized solution with solutions of calcium chloride, zinc chloride, and magnesium chloride" respectively. It is difficult to understand how such extremely crude products could be designated by names which would indicate them to represent chemical entities, and a description of them certainly cannot possess any scientific or practical value. Under the equally illogical title,

[7] *Journ. Chem. Soc.*, 1905, **87**, pp. 349–357 and 896–900.
[8] *Year-Book of Pharmacy*, 1879, pp. 523–533.
[9] *Journ. Pharm. Chem.*, 1892, **26**, p. 445.

"Constituents of Gynocardic Acid," the concluding paragraph of Mr. Chattopadhyay's paper contains the following statements:

"The high neutralization value (230) indicates the presence of saturated fatty acids of the general formula $C_nH_{2n}O_2$, and this, combined with the ready solubility of the calcium and magnesium salts in boiling alcohol, suggests the presence of lauric acid. Further, the ready decomposability of the calcium salts, as also its solubility, makes the presence of linoleic acid very probable. The various quantitative determinations show that chaulmoogra oil is a mixed triglyceride of lauric, chaulmoogric, and linoleic acids." On the basis of such an assumption, which is entirely devoid of any scientific foundation or reason, he then proceeds to state that "the approximate percentage composition calculated from these data gives the following:

"Linoleic acid (series $C_nH_{2n-4}O$)	70 per cent.
Oleic acid (series $C_nH_{2n-2}O_2$)	28 per cent.
Lauric acid (series $C_nH_{2n}O_2$)	12 per cent.
	100 per cent."

It is difficult to reconcile this summary with the statement immediately preceding, especially as the sum of the figures given amounts to 110 per cent.

In the beginning of his paper Mr. Chattopadhyay expresses the opinion that what he considers to be an unsatisfactory condition respecting the botanical source of chaulmoogra oil is supported by the various analyses of different observers. If, however, in view of the very complete botanical and chemical investigations already cited respecting the source, characters, and composition of chaulmoogra (*Taraktogenos*) oil, *gynocardia* oil, and allied products, any divergence of opinion may still be entertained, it is earnestly to be hoped that it would be based on some more substantial foundation than the statements contained in the above-mentioned paper afford.

It may finally not be amiss to emphasize the fact that chaulmoogra (*Taraktogenos*) oil and *gynocardia* oil are totally unlike, both in their physical characters and chemical composition. The difference in physical characters has already been referred to, and with regard to their composition, as established by the series of researches which have also been briefly cited, the following may be noted:

I. *Chaulmoogra Oil* (from the seeds of *Taraktogenos Kurzii,* King).

This oil, which is optically active, consists, to a large extent, of the glyceryl esters of optically active acids of an entirely new type. These acids are represented by the general formula $C_nH_{2n-4}O_2$, and have a cyclic structure. The acid present in the largest proportion possesses the formula $C_{18}H_{32}O_2$, melts at 68° C., has $[\alpha]_D + 56°$, and has been designated *chaulmoogric acid,* while a lower homologue, $C_{16}H_{28}O_2$, melting at 60° C., and having $[\alpha]_D + 68°$, has been termed *hydnocarpic acid,* on account of having first been isolated from a *Hydnocarpus* oil.[10] Both of these acids are beautifully crystalline substances, from which a number of derivatives have been prepared, and their constitution has also been definitely established.[11] Inasmuch as acids of the above-described type had hitherto not been known to occur in a fatty oil, they have been classified by Lewkowitsch ("Chemical Technology and Analysis of Oils, Fats, and Waxes") under the heading of "the chaulmoogric acid series."

Chaulmoogra oil contains, furthermore, a relatively small proportion of palmitic acid and a phytosterol.

II. *Gynocardia Oil* (from the seeds of *Gynocardia odorata,* R. Br.).

This oil is completely devoid of optical activity, and contains none of the members of the chaulmoogric acid series. It has been shown to consist of the glyceryl esters of the following acids[12]: (1) linolic acid, or isomerides of the same series, constituting the largest proportion of the oil; (2) palmitic acid, in considerable amount; (3) linolenic and *iso*linolenic acids, the latter preponderating, and (4) oleic acid, in relatively small amount. A phytosterol (melting-point 133°) was also isolated.

Both the physical properties and chemical composition of the above-mentioned oil render it evident that the chaulmoogra oil of European commerce could never have been obtained from *Gynocardia* seeds. On the other hand, representative samples of commercial chaulmoogra oil have been found to agree closely in character with the oil expressed from genuine *Taraktogenos* seed, thus completely confirming, from the chemical side, the botanical observations of Sir David Prain respecting the source of chaulmoogra oil.

In connection with the above reference to *Gynocardia* seeds

[10] *Journ. Chem. Soc.,* 1905, **87,** p. 888.
[11] *Ibid.,* 1904, **85,** pp. 838–861; 1907, **91,** pp. 557–578.
[12] *Journ. Chem. Soc.,* 1905, **87,** pp. 896–900.

it may be noted that, besides the fatty oil, they contain the crystalline, cyanogenetic glucoside, *gynocardin,* $C_{13}H_{19}O_9N$, which has likewise been made the subject of a complete chemical investigation.[13]

It may be remarked, in conclusion, that it has not been possible in this place to present more than a very brief survey of the above-mentioned series of long, costly, and exceedingly difficult researches relating to chaulmoogra oil and allied products. The consideration now given to the subject would, moreover, have seemed quite unnecessary, had it not been deemed important to avoid, if possible, the confusion which the recently-published paper of Mr. Chattopadhyay is likely to create; for the various statements of different observers are not infrequently transcribed in the literature without due discrimination as to their validity or any indication of their relative value. The hope may therefore be entertained that, by a more careful perusal of the literature relating to chaulmoogra oil, and a just recognition of the results of the researches therein recorded, Mr. Chattopadhyay may not consider it incumbent upon him to pursue his contemplated further study of the "constituents of gynocardic acid."

Hudson, N. Y.

SO-CALLED CONCENTRATED SOLUTION OF SILVER IODIDE.

By John K. Thum, Ph.G.

There is on the market, at the present time, a so-called soluble preparation of silver iodide. That is to say, the silver iodide is in concentration in the form of a solution, and the addition of this solution to a designated volume of water makes a 5 per cent. suspension of silver iodide. Whether this method of dispensing silver iodide possesses any advantages over the usual method is questionable. In the writer's opinion, it would be far safer for a patient to receive a freshly-prepared precipitate of this chemical, well washed, and held in suspension with the acid of a solution of gelatine, Irish moss, or some other appropriate gummy substance.

This solution of silver iodide is made by taking advantage of the fact that silver iodide is soluble in an excess of potassium iodide.

[13] *Journ. Chem. Soc.*, 1905, **87**, pp. 349–357; 1910, **97**, pp. 1285–1289.

One of the claims made for this preparation is that "it is also less expensive" than preparations of the same salt sufficiently diluted for immediate use. When one considers that the solution of this salt requires a *considerable excess* of potassium iodide (the preparation on the market showing, on analysis, at least 60 per cent. of free potassium iodide), and then considers the price of potassium iodide even in normal times, one is averse to agreeing with this statement.

It is also well to remember that potassium iodide as found on the market is usually quite alkaline, and, while it may be true that such a preparation is painless when introduced into the urethra, that does not prove that it is harmless. It is also well to remember that suspensions of silver iodide are frequently used in eye infections, and for that purpose should be very carefully prepared, the silver iodide first being very carefully and thoroughly washed with sterile distilled water. If this technic is not followed, the application of the preparation to an eye condition will result in much irritation, pain and an inflammatory condition that is difficult to control.

The writer's investigation of this preparation revealed that it can be prepared readily according to the following formula:

Silver nitrate	3.70 Gm.
Potassium iodide	17.00 Gm.
Distilled water ad	25.00 Mils

This volume of 25 mils solution, when added to 75 mils of distilled water, makes a 5 per cent. suspension of silver iodide.

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ANCIENT AND MODERN PHARMACY AND MEDICINE IN EGYPT.

By Ahmed M. El Aguizy, P.D.

The history of pharmacy and medicine in Egypt may be roughly divided into three periods—that of the Ancient Egyptian, Mediæval, and Modern.

The ancient Egyptian or Prehistoric Period includes the time of the Ptolemies.

The history of pharmacy in the time of the Pharaohs is not recorded in books, but the inscriptions indicate that they knew of

and prepared blisters, ointments, tinctures, extracted the vegetable drugs, and prepared chemicals; face cream, powders, perfumery, and fixed and volatile oils were also known to them. Sir John Bowring says that "porcelain jars were found in the ruins adjacent to the Pyramids which contained cosmetics and perfumery 4000 years old."

Prescriptions were written by the physicians and priests and sent to be dispensed by the priests of Osiris and Isis, 3500 B.C. The prescriptions were either written on bones or engraved on stones. The hieroglyphics or the ancient Egyptian characters were used, the same as the letters of papyrus of Sent. These letters were claimed by the Egyptologists to be the originals of the letters copied by the Greeks from the Phœnicians and thence transmitted to the Latin.

PAPYRUS EBERS.—Papyrus is the oldest text-book in materia medica, and was discovered by George Ebers, the German Egyptologist. It is the most ancient manuscript which has to do exclusively with medicine and pharmacy, and there is good proof that there was once a medical library of some fame. This papyrus, which is about 12 inches wide and over 250 feet in length, dates from 1550 B.C. This is shortly prior to the time of Moses. The writing of the manuscript is in black ink, but the chapter headings and the weights and measures are written in red ink. It contains chapters on methods of conjuring away diseases from different parts of the body. The following words were to be spoken by the compounder while preparing the remedies: "As it shall be a thousand times, this is the book of healing of all sickness that (Isis) may make free," etc. When taking a remedy the patient was supposed to repeat this incantation: "Come, remedy; come drive it out of this my heart, out of these my limbs! Oh strong magic power with the remedy!" Among the remedies mentioned in the papyrus are many which are revolting to us at the present day. Many others are similar to, or identical with, drugs in common use to-day, as oils, wines, beer, yeast, vinegars, turpentine, oleoresin, myrrh, mastic, opium, absinthium, aloes, peppermint, cassia, caraway, coriander, anise, fennel, flaxseed, juniper berries, henbane, and various gums and resins.

The beginning of both medicine and pharmacy is closely interwoven with superstitious and fabulous beliefs.

The ancient Egyptians regarded Isis and Osiris, brother and sister, and husband and wife, as the patron saints of medicine.

Hermes, who is by the Greeks named Mercury, is looked upon as the originator of alchemy, law, arithmetic, music, and, in fact,

almost all knowledge. The supposed works of Hermes ("Trismegistus"), which were said to be very numerous, have never been found, and there is no warrant for such a character in fact; it may be a personification of a long succession of writers. "Hermes's tomb was discovered by Alexander the Great, full of golden treasures; not, indeed, in metal, but in writing on emerald tablets."

The Egyptians used to prescribe medicine with certain religious ceremonies. Physicians and priests were working hand in hand. A patient was brought in the presence of his god Apis before he could see a physician. This god was nothing but a bird or an animal of special distinguishing marks, exercised by special instructors, and the people gave all they could, and kings spared no money in building the most magnificent temples for the quadruped. The animal had a special room, wonderfully furnished, standing behind velvet curtains; it slept on ostrich feathers, and ate and drank out of vessels of gold. If, while in his presence, Apis should cease eating and happen to lick the garments of the patient, it signified the patient was to die soon. Physicians stopped treating him, because they believed that Apis was endowed with prophetic power and divinity, and the effective constituent and therapeutic action of the remedies were only the spirit of the god Apis. The unfortunate creature was shocked and grieved, for naturally his condition was aggravated, and perhaps he would die from sorrow.

EMBALMING.—The use of preservatives and medicaments was known to the Egyptians. They used to give unusual care towards preserving the bodies of their dead by embalming and protecting them from putrefaction and attacks of insects. The corpses of the kings were placed in the graves, in the crouching position, on rugs, and were supplied with jars of food and water and with their favorite musical instruments. These corpses, probably more than 5000 years old, have been found with skin and hair well preserved; even the food supplied to the wealthy dead was likewise preserved. Embalming in those ages was very important, and necessary, indeed, for sanitary purposes and for the protection of the country from the attack of epidemics and many contagious diseases caused by the putrefaction of mummified bodies disturbed by the overflowing of the Nile twice a year. They carried the art to great perfection, and embalmed not only human beings, but crocodiles and other sacred animals. The art of embalming and the original formulæ have not been discovered yet; it is an important matter and a great oppor-

tunity, which needs the observation of an able investigator to discover what has been lost for centuries. The ancients must have used something that had an extraordinary antiseptic and powerful preserving property; something which preserved nearly everything when applied to either wood or linen, and even foodstuffs which were deposited with their dead. The most interesting instance, without exaggeration, is the wheat found inside the mummies; it has been cultivated after these long centuries without losing its germinative power. This may seem incredible to some people, but it has been proved many times. I think it would be a most marvellous thing for a pharmacist to be able to keep his stock of drugs from being damaged by insects for even a few years, yet here it was done for centuries.

The body of Rameses and hundreds of others which have been preserved for 3000, 4000, and even 5000 years are found in the national museums and can be photographed, as their features and other details are as perfect and clear as if those mysterious men had been dead but a week.

Operation of Embalming Suggested.—The brains were partly removed through the nostrils by means of a bent iron instrument and by the injection of certain drugs, and the intestines were then drawn out through an incision in the left side. The abdomen was cleaned with palm wine and filled with myrrh, cassia, and other preparations; then the opening was sewed up; afterwards the body was steeped seventy days in a solution of natron (neutral sodium carbonate, Na_2CO_3); after the steeping the body was washed and handed over to the swathers (lowest order of priests), by whom it was bandaged air-tight in gummed cloth and was ready for the coffin. These formulæ suggested were not efficient and, being very expensive, could not replace the ancient formulæ. The operation mentioned above cost $1215, which was a very high price for the average rich man of that age to spend in preserving his body, and, on the other hand, such a sum was a tremendous fortune in ancient times. The researches of Dr. Elliot Smith, of Cairo, proved the great importance of embalming for the history of disease and for characterization of the races inhabiting Egypt.

Anatomy in the Ancient Time (3500 B.C.).—The knowledge of anatomy of the early Egyptians was necessarily limited, owing to their reverence for the human body and the severe penalties inflicted upon any who practised dissection. Even the priests themselves were not permitted to make the incision in the abdominal cavity which

was necessary in their embalming process, and that office was performed by individuals called swathers, whose position in the community was comparable to that of the executioners.

PRACTICE OF MEDICINE AND PHARMACY.—Herodotus, writing in the fifth century, B.C., says of the early Egyptians that "no doctor was permitted to practise any but his own branch," which would indicate that there were specialists even at that remote period. Other Egyptian historians record the fact that the doctors were all priests and they were paid out of the royal treasury, but were permitted to take fees also, and that there were penalties provided for attempting to diminish or vary in any way the ingredients of a prescription—which show that substitution was even then a recognized evil.

In order that a physician could practise he had to take an oath before the God of Medicine, Horus, the son of Isis, called Apollo by the Greeks, that he would live up to the principles of his own profession; that is, he would not prescribe medicine except when it was needed, and by all his means and professional power heal all who were in need of his services.

EXUDATIONS OF MUMMIES.—Thus the bituminous and fatty matters found about the mummies and their wrappings were employed as a sovereign remedy, particularly for wounds and contusions. A brisk trade began in these "exudations" of mummies. This led further to the medical use of fragments of the mummies themselves, and, finally, the starting point was lost sight of, so that the dried or prepared flesh became one of the official forms of mummy in the Pharmacopœia. It was not until the eighteenth century that the use of mummy in all its forms waned, and even in some of the least progressive quarters of central Europe it survived even to the middle of the nineteenth century. The idea of this is based upon the preservative and antiseptic properties absorbed by the fat and saturated in the mummy; the people believed this must have had wonderful healing properties. This idea originated in Egypt and was practised for some time. A workingman even to-day believes that if he cuts himself seriously and goes directly to an ancient tomb and sprinkles some dust on the wound or wraps it with a linen from a mummy the wound will rapidly heal. Of course, we know that it is contaminated with tetanus spores or bacilli, and is a very dangerous practice, and is the result of ignorance and lack of sanitary and scientific knowledge.

CHEMISTRY.—Chemistry was advancing in their time. They discovered most of the alkali metals, alkali earths, and, among the metals, gold, silver, iron and their alloys. Glass containers of different metallic and basic colors were found in the temples. The Egyptians of those remote ages had a profound knowledge of the art of making enamel and imitating precious stones, the composition of which still remains a mystery. The arts and industries of dyeing and painting were practised by them. The wonderful permanent and shiny appearance of their paints is to be seen in their temples and tombs even to-day, and is proof of their ability and of their scientific knowledge in preparing such bright and clear colors. A sarcophagus which was presented to the University of Pennsylvania Museum is a handsome piece of work and is at least 3000 years old. Its painting is so wonderfully perfect in brilliancy and color that it exceeds any painting of to-day.

PTOLEMIES (400 B.C.–700 A.D.).—The Ptolemaic empire included the prosperous reign of the dynasty founded by Alexander the Great, the Macedonian ruler and the best colonizer the world has ever produced. He founded the city of Alexandria and its great libraries, which was the rallying point for all learned men during the last century and a half, B.C. Alexandria was the only home for information and the seat of learning, while other nations were declining as the results of ignorance and ravaging the earth with the evils of war. The Egyptians and the Greek colonizers, by their wide knowledge and common sense, kept alive the sacred flame of science and preserved mankind from relapsing into its barbarian nature. This was due to the enlightened government and wisdom and liberal opinion of the Ptolemaic kings. Alexander the Great, Ptolemy Soter (Savior), and his immediate successor, Philadelphus, were the first kings who by their authority and enthusiasm patronized science and scientific men. They were the first who encouraged physicians to dissect the human body, and prevented the prejudices of ignorance and superstition from retarding the welfare of the human race. To Hrophilus, Erasistratus, and others we are indebted for our first knowledge of anatomy and histology. Erasistratus described the valves of the heart and distinguished them by the names bicuspid and tricuspid, and he studied and described the blood circulation. Ptolemy himself was present at some of these post-mortems, and among the discoveries which may be credited to them are the fact that the nerve trunk originated in the brain and spinal cord and that

they are of two different kinds. Also they described and designated the covering of the brain, the striped muscles, nervous system, and studied the anatomy of the eye. Both these physicians were indeed the principal support of medical history.

Pharmacy in the Ptolemaic period was not so progressive as compared with medicine, because those who practised it gave most of their time to the medical investigators and surgical discoveries. Philosophy, science, and other branches, especially pharmacy and medicine, were taught in the University of Alexandria. The Society of Scientists and Scholars, headed by the king, was attracted by the wise men from all the world, and the membership fee was the presentation of a book, either written by the member himself or by a famous writer of his land, to the public libraries of Alexandria. The works of Hippocrates, the greatest man in pharmacy and medicine of the time, were bought by Ptolemy, who paid the highest prices, so that his library would be complete.

Claudius Galenus, commonly known as Galen, was the last of the great scholars of the Alexandrian schools and the most celebrated of ancient writers. He wrote over 500 books on various subjects, gathered up all the medical and pharmaceutical knowledge of his time and left it as the authoritative account of sciences for centuries. He was a celebrated physician, pharmacist, and philosopher. Pharmaceutical preparations of drugs, as tinctures, extracts, infusions, and decoctions, etc., still bear his name, being known as galenicals.

LIBRARIES.—The Alexandrian libraries, ten in number, were the most important, as they were the most celebrated, of the ancient world. They were organized and properly established in separate buildings. The number of volumes was very large. Nearly two-thirds of the number were medical and pharmaceutical, and the balance were chemical, philosophical, and scientific books, etc. The libraries were in flourishing condition until they were destroyed, after the conquest of Alexandria, by Cæsar setting fire to the fleet in the harbor, the flames accidentally extending to the large library. Thus, as the result of the unnecessary evils of a war, nearly four centuries of wisdom of these intelligent men was put to an end in a year, a month, or even in one day.

MEDIÆVAL PERIOD (641–1517 A.D.).—The mediæval or the Arabian period began with the invasion of Alexandria by Mohammedans under the Caliph Omar, 641 A.D. With little difficulty the army of the Caliph wrested Egypt from the Romans. This conquest lasted

for a period of nine centuries, during which a fresh impulse was given to science, knowledge, and scientific investigation and researches. Amru, by the order of the Caliph, built the Egyptian capital, Cairo. The conquerors improved their new city considerably and succeeded in making it the great centre of learning during the age when the European civilization was most obscured. Ancient Greek manuscripts were translated; universities and academies were built, which produced for the rising schools of Europe teachers in philosophy, mathematics, medicine, chemistry, and pharmacy. Their Arabic books were translated into different languages, copies printed and distributed throughout Europe.

It would be impossible to give a fair representation or full description of the great genius, enlightenment, wide knowledge, wisdom, and activity of the Arabians, who played the most important and imperishable part in the development of medicine, chemistry, botany, and pharmacy in mediæval times. They were the first nation that extended the practice of pharmacy and separated it from the practice of medicine, and this was recognized in the eighth century, legalized, and carried out in the eleventh century. They were the exploiters, if not the introducers, of a vast number of new drugs, such as senna, camphor, sandalwood, rhubarb, civet, musk, aloes, cassia, tamarind, nutmeg, clove, cubeb, aconite, mastiche, ambergris, granatum, most of the umbelliferæ family, pellitory, several gums, gum-resins, oleo-resins, and mercury compounds. They were the originators of syrups, jalap, alcohols, aldehydes, ethers, and introducers of alembic, all Arabic terms; and the gilding and silvering of pills (not for making them attractive, but for the aiding of their medical effects). They introduced precious stones and gold and silver salts in the treatment of diseases. They were the inventors of H_2SO_4, HNO_3, and muriatic acids, aqua regia, and flavoring extracts made of rose water, orange and lemon and from other members of the citrus family. They were the first people who established apothecary shops for compounding and dispensing drugs, and placed these shops under regulation, scientific examination, and severe legal restriction.

It is fitting, therefore, to give a brief outline of the great pharmaceutical and medical development and to emphasize that there were at that time, among the Arabs, leaders in medicine, pharmacy, pharmacognosy, chemistry and, in fact, most sciences. Their medical and pharmaceutical books and pharmacopœias were standard authorities throughout the civilized world. These books were referred to as

much as the official pharmacopœias and other official books, as well as the United States Dispensatory and "Remington's Practice of Pharmacy" and other medical and pharmaceutical books, even as late as the early part of the nineteenth century. Most of the pharmacopœias of civilized countries, without exaggeration, are based on the Arabian principles and botanical knowledge. Oser says "the heavy hand of the Arabians is sensed in the enormous bulk of the United States Pharmacopœia."

ARABIAN WRITERS.—The following is a very brief mention of a few Arabian writers, only to give one an idea of the great and able authors that Egypt and other Arabic countries have produced:

Abdullah Gaber Ben Hayyan, commonly called Gaber, one of the most famous Arabian chemists, lived in the eighth century. He was credited with being the originator of chemistry, but this was based upon insufficient information, as the first chemical knowledge was derived from the temple laboratories of the ancient Egyptians. He was acquainted with alum, green vitriol, saltpetre, sal ammoniac, corrosive sublimate, red precipitate, and was the discoverer of oil of vitriol, aqua regia, muriatic and nitric acids, and for the use of which he gave directions. He extracted and purified his chemicals by the process of distillation, sublimation, and filtration. He was a great man and has done more for chemistry than his predecessors, in spite of the fact that he gave most of his valuable time and great wisdom in an effort to change lead, copper, and iron into metallic gold or silver, and in his search for the elixir of life, this latter being the result of his philosophical follies.

Abu Bakr Mohamed El Razi, known as Rhazes. He was the first physician who described smallpox, measles, Asiatic cholera, and epidemics in an accurate manner. He was a greater chemist than a physician, and he was the first to declare that "he who knows no chemistry does not deserve the name of a philosopher." He was a clear thinker, a ready operator, and a man of remarkable foresight and proved experience. Died 925 A.D. His chief medical work, "El Mansuri. Chemical works. Perfectionis Liber. Duodecirri Lebri de Arte Chemica. Liber Lapidis Minor and Confirmatio Artis Chemial."

Abu Mohamed-Ibn Baitar died 1248 A.D. His great work in materia medica in which he gave a full description and constituents of 1400 drugs, of which 300 were new, has been unsatisfactorily translated into German. Other books have been translated into

Latin, as "Liber Magnæ Colletions Simplicissime Allmentorum et Medicamentorum."

Abu Ali Alhussain Ben Sina, known as Avicenna (980–1037 A.D.). He was the "Hippocrates and Aristotle of the Arabs, and the most extraordinary man that nation produced, well known to all people in all ages, and his works even superseded those of Hippocrates and Galen." He wrote several books on drugs and medicine, and his "Canon Medicinal" was most complete and gained for him a great reputation in medicine and surgery, and it was the leading text-book in European universities as late as the sixteenth century. His scientific skill enabled him to introduce and prepare new chemical remedies and form a great many combinations which are in use even at the present time, which gave him wide and everlasting fame.

Ismail El Jurjani. His book gave a complete description of urine examination and the most complete directions for detecting sugars and foreign matters in urine.

Ali Ibu El Abbas wrote several books on pharmacy which were the standard authority in Europe in the tenth century.

Moses Ben Maimon (called Maimonides), the most pious, loyal, and faithful physician. His prayer is memorized by most pharmacists and physicians. He is called the Second Moses. Died in Cairo, 1204 A.D., and buried in the Holy Land.

Abul Qasim, known as Abulcasis, the most popular physician of the tenth century, and the best-known Arabian writer on drugs in mediæval Europe. His "Manual Grab-Eldiu or Apothecary" was referred to by pharmacists in their preparations. His book on pharmacognosy which bears his name was printed in twenty-six editions in the sixteenth century and was standard authority on what would now be called materia medica. The first English Pharmacopœia compiled and issued by the College of Physicians in London owed its big volume and most botanical information to his wide knowledge. He was the first physician who divided purgatives into very mild or laxative, as tamarind, prune, fig, cassia, manna; mild or simple purgatives, as absinthium, rhubarb, senna, aloes; strong purgatives or drastics, as jalap, scammony, colocynth, colchicum His manuals were very valuable, and the esteem in which his works were held was shown by the fact that a Latin translation was one of the mediæval books printed in the sixteenth century as "Leber Theorical nec non Practicæ Alsaharavy." His book on surgery, in two volumes, was published at Venice (1497), at Basel (1541), and at

Oxford (1778), and used as late as the end of the nineteenth century. "Abulcasis de Chirurgia Arabice et Latine cura Johannis Channing."

ARABIAN HOSPITALS.—The Arabs built hospitals all over the Arabian colonies. One of the greatest was the hospital of "El Mansur" of Cairo. It was a huge building, quadrangular in structure, with fountains playing in the surrounding gardens. It had separate wards for different diseases and separate buildings for epidemics, bath-rooms, diet kitchens, and balconies for recreation. It employed male and female nurses. The hospital had an income of about $650,000 a year. From that sum it gave a suitable sum to each convalescent on his departure so that he or she might not have to go to work before complete recovery. The patients were taken care of and they were nourished upon rich diet and attractive food. The sleepless patients were provided with soft music and a companion for entertaining them. The number of patients was estimated at about five thousand, including those who came daily to the hospital clinic (dispensary). The operating rooms were well equipped; there were consulting rooms, and the sitting parlors were magnificently furnished. The pharmacists', nurses', and physicians' homes and other buildings relating to the establishment were all within the compass of the hospital.

MODERN PERIOD.—Egypt, with a population of about 15,000,000, contains only about 1500 pharmacies—few, indeed, in comparison with the apothecaries and drug stores of Philadelphia, which are roughly estimated about ten times the proportion. A large number of the establishments in Egypt are conducted by foreign pharmacists, the majority of whom have graduated from recognized pharmacy schools of Europe, but the remainder are not graduated at all, being only practical pharmacists from foreign countries who have received their diplomas either by buying or inheriting them. The regulation controlling the right to practise in Egypt some time ago was only a man's identification and the recommendation of his Consul, which was required by international law. There are many Italians, Greeks, Roumanians, etc., in Egypt, and many of them are nothing but smugglers, making money by selling narcotics, poisons, and habit-forming drugs, and violating the laws under the forged name of a pharmacist. The government, ten years ago, recognizing this fact, and, in view of the dangerous effect of illegal practice, passed the following regulations:

A pharmacist or physician wishing to practise in Egypt should be

a graduate of a recognized school and be able to produce documents from his consulate showing nationality and also pass government examinations. An assistant pharmacist should produce a certificate from his employer or some one in authority testifying to good conduct and character before being admitted to examinations. If successful, the assistant is entitled to practise pharmacy and is allowed to dispense prescriptions containing poison and take charge of the poison locker during the absence of the principal at meal-time or on other brief occasions. The examination board consists of several government and civil pharmacists, headed by the president of the School of Medicine and Pharmacy in Cairo.

Narcotics and habit-forming drugs and chemicals, poisons, and explosives may not be sold or given without a legal prescription from a known physician. Poisons shall not be sold to any person who is unknown to the pharmacist unless recommended by a known person, and not until an entry is made in a special book kept for this purpose, stating the date of sale, name and address of the purchaser, and the quantity of the article sold and why it is needed. The sign of the purchaser and prescriber or introducer must be affixed to the entry. Those who disobey the rules, if natives, are fined or put in prison, or both, and, if foreigners, are banished and their establishments confiscated.

The average pharmacist in Egypt is well educated, conscientious, and lives up to the ideals of his profession. He considers himself a proficient man, and holds a position similar to that of a physician or other professional man. Some do not consider themselves commercial or business men, as is the custom in America, and it is an insult to ask a pharmacist to sell you a box of candy, writing-paper, or a note-book, and it is still worse if you ask him for cigarettes. The reason for this is that the position of a pharmacist is higher than that of a tobacco dealer. Their stock is nothing but medicines, and the only side lines that are to be found in their pharmacies are toothbrushes, rubber goods, perfumery, and a miscellaneous assortment of patent medicines, sick-room requisites, and, for the accommodation of American tourists, fancy goods of all kinds, with the exception of tobacco, have been introduced in some pharmacies.

Pharmacy in Egypt, as a business, is very profitable and largely overdone in large cities where there are millionaires from all over the world.

The pharmacies are very sanitary and clean and up-to-date in

fixtures and showcases. The rentals are very high, and vary from $600 to $4000 a year, depending upon the locality and the reputation of the place. Pharmacists in Egypt are friendly and competition is not so great, because the government limits the number of shops and each one of them has work enough to keep him busy. The Egyptian pharmacist is well trained when it comes to the business side of his profession. He has a pleasing personality, and is polite to customers, but I regret to say that he never depends on himself to manufacture his preparations. He is of the class that would rather read a story than run a percolate, and it makes no difference to him if he advertises the preparations of a wholesale house more than his own. He rarely takes advantage of the opportunity offered of making his own preparations, of course, which would pay him well, since no large duty is charged on alcohol. There is very small tax on spirits even when used for domestic use, if not denatured.

PRACTICE OF PHARMACY.—The practice of pharmacy in Egypt is a very difficult task indeed, as there is no official pharmacopœia for the country. The majority of the physicians are educated in foreign countries and naturally prescribe the preparations they have studied in their medical schools. The pharmacist must always be alert, and before dispensing a prescription he has to satisfy his conscience that he is dispensing the required preparation.

Before the standardization of poisonous drugs and preparations at the Brussels Congress, in 1902, the mistakes of pharmacists were sometimes fatal, since the difference in strength was enough to cause serious results.

Tincture of cantharidis		Tincture of strophanthus	
U. S. P. and F. P...	10 gm. in 100 Cc.	U. S. P.	10 gm. in 100 Cc.
B. P.	10 gm. in 800 Cc.	B. P.	10 gm. in 400 Cc.
		F. P.....	10 gm. in 60 Cc.

Other preparations also vary in composition or color. Solution of potassium arsenite of the F. P. is of a bright yellow color, and contains in addition to potassium arsenite, Alcoolat de Melissé Composé and alcohol 90° C. instead of compound tincture of lavender. Hoffman's anodyne of the F. P. consists of the simple spirit of ether, while the U. S. P. and B. P. contains also etherial oil.

Prescriptions are written mostly in Latin; very rarely in English, French, Italian, Greek, or Arabic. The directions are generally written in English, French, or the spoken language, the Arabic, so

that being well versed in languages is essential for a first-class pharmacist.

There is splendid opportunity for American pharmacists to introduce their wonderful system and preparations, not only in Cairo, Alexandria, and other Egyptian cities which are considered the largest winter resorts for tourists, but all over the Oriental countries.

THE CITY OF CAIRO.—Cairo is one of the most fascinating cities in the world. With its Byzantian and European architecture it is a most wonderful place, and this is credited to the Caliphs, Mamelukes, and other rulers. It is largely due to the Khedive, Ismail Pasha, that the city of Cairo has been developed to such an extent that the Egyptian capital is a second Paris. He built the magnificent opera house of Cairo, and palaces for entertaining his guests, the European royalties invited for the opening of the Suez Canal. Cairo is really a beautiful city, and we Egyptians are very proud of our capital, not only for its mild winter climate and for its antiquity and ruins, but because of its beautiful Nile and evergreen fields surrounding it, which are an incomparable attraction to the tourists. Omar said in one of his poems: "Who hath not seen Cairo hath not seen the world; its houses are palaces, its air is soft, its odor surpassing that of sandalwood, cheering the heart."

SOME EXPERIENCES WITH SALOL-COATING OF PILLS

BY J. C. AND B. L. DEG. PEACOCK.

The coating of pills with salol in order to render them insoluble in the stomach for the purpose of carrying the medicine into the intestines has been practised for years past. Methods have been frequently described and one is set forth in the current edition of the National Formulary.

During the past two years, salol-coated pills have been frequently called for, and the knack of doing it had to be developed by our prescription department.

What is about to be said is by no means a discovery, but merely a recitation of experiences in the actual practice of the process; a few simple facts which may help those who are called upon to do this work for the first time.

Two methods of salol-coating have been suggested, first, that of dipping the pills into the melted salol by means of pins and ro-

tating in the air until the salol has solidified, removing the pin when sufficient coat has been taken on, and then closing the puncture with a drop of melted salol. Second, the method in which the pills are placed in a vessel in which salol has been melted, and the vessel rotated until the salol congeals.

The second method is the plan given in the National Formulary. The first method does not appear to have been as generally used as the second. It is very much more tedious to stick pins into the pills, dip them into the salol and rotate a number of pills at one time than to place the pills, all at once, into a vessel and rotate it. Besides the salol sometimes chips off when the pin is withdrawn and the sealing produces an unevenness of coat which is not pleasing to the eye.

The second method is, therefore, much less tedious, and more rapid, and with a little practice gives excellent results both in amount of salol applied and in appearance of finished pill.

The pills which were most frequently ordered to be salol-coated contained silver nitrate, sometimes with extract of hyoscyamus, sometimes with opium. The mass should be hard in order to get the best result. It is also desirable to have pills as nearly round as possible. The usual dusting powders can be applied, and while it is best not to leave more of this adhering than is necessary, the slight amount which may be needed in some cases is not objectionable. Size of pill does not matter, although as in almost all pill work, a pill of one grain weight is easier to manipulate than a smaller one.

In the experiments made, mass was added to the very small pills; powdered licorice root, kaolin, talc and confection of rose were all used with good results.

The National Formulary, page No. 122, section No. 2, Enteric Pill-Coating, paragraph B, Salol-coating, reads as follows:

"The pills, carefully freed from dusting-powder, are dropped into a capsule containing enough Salol (approximately 0.06 gm. (1 grain) to every 0.19 gm. (3 grains) pill), previously melted by the heat of a water-bath and allowed to cool so that by passing the hand along the bottom of the dish there is scarcely any warmth felt, and the capsule is then rotated until the pills are coated and the salol has congealed. This process is repeated twice, each time reducing the salol about one-half. Finally, a finishing coat is applied by using only sufficient salol to coat the dish when melted; the

dish being now kept quite warm (almost hot), the pills rotated quite rapidly until they are quite shiny, then turned into a cool dish, and the rotation continued until the pills are quite cool."

This plan was followed to the letter, in the first several attempts which were made. The results, however, were not satisfactory, mainly because insufficient salol is ordered for the first three treatments. Further, the use of more heat in the fourth treatment is very likely, in fact almost certain, to melt off some of the salol, and again, transferring to a cool dish produces uneven coating due to a too sudden or irregular reduction of temperature. It was, therefore, found better to take more salol with which to start the treatment, and also as nearly as possible use the same temperature in all of the treatments. After a number of experiments the following plan was marked out and has been used with constant success by a number of operators.

One of the most important details from the standpoint of practice is the selection of the vessel in which to do the coating. Concave capsules and similar shaped vessels are not well suited because the pills tend to roll out during the rotation of the vessel, or at least get to some extent out of contact with the melted salol. Flat bottom vessels with flaring sides are better suited because the pills are not so likely to be thrown away from the salol during rotation. But there is still some chance of the pills flying over the flaring sides. The vessel which appears to be best suited is a flat bottomed, white enamel pan, with perpendicular sides; a handle gives additional convenience to this vessel; a size convenient for coating 24 to 30 pills is about four inches in diameter by about 1¾ inches deep. The inner surface should be smooth. The material of this vessel seems well adapted to the gradual cooling of the salol, a feature which is essential to success. The perpendicular sides of this vessel prevent the pills from flying out and the flat bottom keeps the pills in constant contact with the salol.

For twenty-four pills of one grain each, twenty grains of salol were usually found to be sufficient for the first three applications, and for the fourth and final treatment about seven grains additional were required.

The vessel having been decided upon, the proportionate amount of salol is placed in it, then warmed over a direct flame just sufficiently to melt the salol (a water bath is unnecessary), and the salol flowed over the bottom and into the angle of the vessel. The

temperature is now allowed to fall until the salol is nearly ready to solidify; at this point the pills are placed in the vessel, which is immediately rotated to prevent the pills from sticking together either from capillarity through melted salol or neighboring pills, or from sudden reduction of temperature congealing the salol in the pills. A thump against a block or the hand will separate pills which rotation alone does not. Rocking the vessel on the angle will also keep the pills separated and in a motion well suited to proper coating. The pills must not be rotated too rapidly even in the flat-bottomed dish with perpendicular sides, as the centrifugal force may throw the pills against the wall of the dish and out of contact with the salol.

Resting the vessel upon the counter or the hand during rotation, and using just enough motion to keep the pills separated gives the best result. The vessel should be rotated or rocked until free from sensible heat. The pills are then turned out into a box. The coat of salol taken on in this first treatment will not usually mask the color of a black pill. For the second treatment, the dish is again heated just sufficiently to melt the salol remaining in it, when it has cooled to some extent, the salol still liquid, the pills are put back into it and rotated as before, until cold.

The second treatment will show a decided change in appearance. A third application of salol is made in the same manner. This treatment appreciably increases the shell of salol. For the fourth coating it is necessary to supply more salol, usually about one-third of the original amount taken, it being added to whatever remains in the vessel. For the fourth and final coating, the vessel does not need to be made any warmer than for the first three coatings, nor is it necessary to transfer the pills to another dish, as suggested by the National Formulary.

The rough or uneven appearance of the coating that may be met with in one's first efforts can be repaired by heating sufficiently to melt off all the salol, and then resorting to proper conditions. This rough appearance is usually due either to insufficient salol or to a sudden drop in the temperature of the melted salol.

Should the pills partly coated be thrown into a vessel which is too hot, the salol will be melted at the point of contact and the pills show unevenness where salol has been lost, or even bare spots. To remedy this appearance, melt off all the salol, and return to the conditions outlined.

As to the number of pills that can be coated in a vessel of given size, twenty-four to thirty can be conveniently done in the one described. Even fifty can be done in this vessel, but experience will be needed; for fifty or more pills a larger dish should be provided, or the lot divided for treatment.

To indicate the wide scope of possibilities in salol-coating, pills which have been massed with petrolatum have been coated, and a sample is here shown. Gelatine capsules are also ordered to be salol-coated. This can be done by the same method. Hard capsules containing liquids, such as creosote, can be coated by first placing the capsule inside of a slightly larger one. A sample is here shown. Soft elastic capsules may also be enveloped in salol as sample shows (*Proc. Penn. Pharm. Assoc.*, 1915, p. 258).

STEARIC ACID AS A COATING FOR ENTERIC PILLS.[1]

By William G. Toplis.

The subject of this paper has been more or less in doubt for several days contingent upon certain results within my own economy.

It was our desire to prepare a reliable coating for pills that should protect the medicament from any action in the stomach and release its activity in the intestinal tract.

Such products being commonly known as Enteric Pills, the problem naturally divided into several sub-divisions:

First. Selection of the coating.

Second. The application of the coating.

Third. Proving the effectiveness of the coating.

First. The selection of the coating material, of necessity, is controlled by its behavior in the juices of the stomach. Certainly, the material should remain intact there, and on passing into the intestine it should readily yield to the intestinal secretions. Having in mind the acid reaction of the stomach and the alkalinity of the intestinal tract, the material that seemed to meet both conditions most admirably was Stearic Acid. Therefore, a consideration of the properties of Stearic Acid was necessary to carry out the second step, namely:

Second. The application of the coating.

The first plan tried was fusing Stearic Acid and dipping into the liquid the pills by means of pins after the ancient manner of gelatin

[1] *Proc. Penn. Pharm. Assoc.*, 1915, p. 262.

coating. This was not satisfactory, neither for speed nor for quality. Next we tried a porcelain dish containing fused Stearic Acid through which the pills were rolled until the coating was thick enough and set hard, after the manner of Salol coating. This was not satisfactory, the pills were rough and a poor result pharmaceutically.

The best result was obtained by dissolving considerable of the Stearic Acid in Ether: Place the pills in a porcelain dish of ample size, pour a little of the Stearic Acid solution upon the side of the dish, not upon the pills, roll the pills through the liquid until they are covered and nearly dry, then transfer the pills to another dish, clean and dry and continue the rolling until the coat is quite hard. The second dish produces a better finish than when the operation is completed in the original dish. Repeat this operation until the coating is sufficiently thick.

The result by this method is good. The coating finishes with a smooth satin-like gloss, it is entire, and resists water five hours. The coat may be colored if desired, for example by heating Ground Alkanet Root in the fused Stearic Acid, etc. This result encouraged us to proceed to proving the effectiveness of the coating.

This matter required the use of some medicament whose action is certain and unmistakable when taken into the stomach, but whose action, when passed into the intestine, is attended with different manifestations so that the two sets of phenomena may be readily differentiated. The drug that most completely met the specifications seemed to be Ipecac. Accordingly we made up a number of pills containing five grains each of powdered Ipecac, swallowed one, not coated, and awaited the result. The wait was brief, the effect was unmistakable. The verdict, good Ipecac. After the lapse of a day or two, when feeling quite normal, swallowed another Ipecac Pill, one of the same lot, but this time coated, as above described. Waited twenty-four hours, no emesis. Instead, there was noticeable intestinal activity corresponding to the physiological action as described by the U. S. Dispensatory in the article on Ipecac, thus proving that the coat of Stearic Acid has protected the pill from any action in the stomach.

Next prepared the following liquid laid down in the Pharmacopœia among the tests for Pancreatin:

Pancreatin	0.28	gms.
Bicarbonate soda	1.5	"
Tepid water	100.00	"

This liquid was maintained at about 38° C. One of the coated pills was suspended in the liquid, timed, and the effects observed. At the end of five minutes the coating was visibly attacked; after fifteen minutes had passed the brown color of the pills appeared through the coating in spots. At the end of half an hour the coating could, by agitation, be washed from the pill, and the pill also was beginning to disintegrate.

While it is true that the above described liquid is not identical with the pancreatic fluid of the intestines, it is reasonable to believe that its digestive power is not greater than the natural secretion, nor yet is it more alkaline, the latter property being largely, if not wholly, responsible for the action upon the Stearic Acid. Therefore, assuming the premises to be correct, it would follow that a pill, so coated, could not pass through the intestinal tract without, at least, being denuded of its coating.

THE PHARMACY OF OXY-PINENE.[1]

By Henry C. Blair.

Oxy-pinene, or pinene ozonide, is so little known to pharmacists that it may be well first to consider what is known about its composition chemically and its use therapeutically before taking up briefly the pharmacy of this most interesting substance.

In May, 1915, issue of the American Journal of Pharmacy appears an article on oxy-pinenes by J. Emil Blomén, A.M., Ph.D.

He says: "Nowhere in Nature can be found a more marvellous 'dead' organic substance than this one (Terebinthina) which, like a living being, inhales oxygen from the air and, transforming it, gives it off in another form."

We know that the pinene is the substance that "inhales" oxygen-forming oxides which are given off as oxygen. If, in place of oxygen, ozone is placed in contact with pinene, under certain conditions it will be "inhaled" and ozonides will be formed which will give off oxygen in a nascent form.

"When ozonides of pinene come in contact with moisture, they are decomposed, forming peroxide of hydrogen and oxygen compounds of pinene. On prolonged standing or by heat, intermolecular or auto-oxidation will take place, resulting in the higher oxidation products of pinene, pinonic acid, etc.

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[1] *Proc. Penn. Pharm. Assoc.*, 1915, p. 319.

"Oxy-pinene, or ozonide of pinene, $C_{10}H_{16}O_3$, is a heavy, viscid liquid of a light yellow or lemon color, having an agreeable turpentine odor and taste. It is soluble in some fixed oils, most volatile oils, chloroform, ether, alcohol, etc. Dr. Blomén promises to give a history of the uses of the oxy-pinenes, and we hope he will include more of the chemistry also (see AMER. JOUR. PHARM., 1915, p. 398).

"Oxy-pinene is prepared by exposing the vapor of pinene to a current of ozonized air, prepared by the action upon dry air of a high-tension electrical discharge. An addition occurs between the pinene and oxygen, resulting in the production of a dense white vapor (oxy-pinene)."

This description is taken from the very able article by Dr. Bertram H. Waters, M.A., M.D., published in the *Medical Record,* February 13, 1915. He says, further, that in making oxy-pinene, only pure pinene and ozonized air should be used.

From clinical observation, Dr. Waters concludes that "Oxy-pinene is useful in subacute and chronic affections of the respiratory system, and is indicated as a mild stimulant to the mucous membranes and other tissues. When brought in contact with infected surfaces, it inhibits the growth of certain pathogenic microörganisms, and, by its pathogenic property, increases the circulation in the infected area, thus promoting the destruction of such organisms by phagocytosis."

It is reasonably certain that the treatment of wounds with old turpentine, found by surgeons during our Civil War so useful against gangrene, owed its efficacy to oxy-pinene in a crude state.

We have been informed that this same old-fashioned treatment is now in use in the German army.

The ozonide of pinene, or oxy-pinene, as Dr. Waters calls it, is probably the most concentrated form of the valuable parts of "old turpentine," and therefore should be particularly valuable in treating wounds, ulcers, etc.

In making pharmaceutical preparations of oxy-pinene, it must be remembered that decomposition with formation of hydrogen peroxide and pinene compounds takes place when water is used, and, unless this is desirable, water is to be avoided.

Also, all oxygen compounds loosely combined are more or less dangerous to handle unless care be used. High temperatures are to be avoided, or exposure to air for any length of time. For instance, in making an ointment of oxy-pinene, such bases as Ungt. Aquæ

Rosæ, Adeps Lanæ Hydros., etc., are to be avoided on account of the water they contain. Also, the ingredients should not be melted together, or, if they are, the oxy-pinene should not be added until they are cold, as any excess of heat will cause " the intermolecular or auto-oxidation " mentioned by Dr. Blomén in his paper above referred to.

In making suppositories, the heat required to melt a cocoa butter base is so little that it need not be considered; but, as oxy-pinene does not combine well with cocoa butter, and as there are so many qualities of cocoa butter on the market, and as there is another substance superior in every way and inferior in no respect, we need not hesitate to mention stearate from cocoanut oil as being the best vehicle.

About one per cent. of oxy-pinene in rectal and vaginal suppositories has given excellent results clinically.

For use in treating eczema, skin affections, hemorrhoids, etc., a very efficient compound ointment has been in use for some time in an experimental way clinically. It is made by using a base composed of cocoanut oil and petrolatum, talcum, starch and oxide of zinc, resorcinol, and oxy-pinene.

Considerable experimental work has been done in an endeavor to produce a powder for dusting wounds and for internal administration in enteric pill or capsule form. It is believed that diatomaceous earth produces the best results.

A powder made by incorporating one part of oxy-pinene with two parts of Kieselguhr is satisfactory. Such powder should be kept in sealed containers, for not only is oxy-pinene in this form liable to undergo auto-oxidation, but the Kieselguhr seems to have a catalytic action, as the powder gains considerable in weight when exposed to air for a comparatively short time. One would suppose this extra weight to be water from moisture in the air, but careful chemical examination has proved it to be oxygen. It is therefore a fact that through the catalytic action of Kieselguhr this powder absorbs oxygen from the air, which makes it a more valuable dressing for wounds than it would otherwise be.

Dr. Waters has found oxy-pinene vapor to be a useful form with which to treat disease. It is not a gas, but a vapor, and is made up of such finely-divided particles that it floats about in the air, resembling smoke. It is produced by bringing pinene ($C_{10}H_{16}$) vapor and ozonized air into intimate contact in a mixing chamber.

The pinene vapor is produced by allowing a current of dry air to pass over the surface of volatile pinene. The ozone is made by silent electrical discharges in purified air. In order to avoid the production of nitrates and gaseous peroxides, the air which is used in generating oxy-pinene must first be freed from moisture; this also allows a higher degree of saturation with the volatile pinene.

Oxy-pinene vapor may be inhaled mixed with the air of a room or directly from the generator by means of a suitable mask. For the treatment of superficial lesions on the surface of the body it is used by allowing it to flow directly upon the affected surface.

When inhaled, oxy-pinene acts as a stimulating expectorant. When applied to the skin, it acts as an antiseptic stimulant.

Summarizing:

Oxy-pinene is an ozonide of pinene, a chemical compound consisting of one or two molecules of ozone (O_3) linked to one molecule of pinene ($C_{10}H_{16}$), the active and chief constituent of oil of turpentine.

It is produced in two forms, a vapor and a pale yellow liquid of honey-like consistency.

On contact with moisture it breaks down into peroxide of hydrogen, oxides, aldehydes and ketones of pinene.

Exposed to high temperatures, auto-oxidation takes place.

It is useful in treatment of tubercular affections, wounds, ulcers, diseases of the mucous membranes, eczemas, hemorrhoids, etc.

It is an antiseptic, expectorant, stimulant, and oxidizing agent.

Mixed with diatomaceous earth, one part to two parts, it makes a suitable powder for dressing ulcers, old wounds, etc.

Made into suppositories with stearate from cocoanut oil, about one per cent. strength, it is very useful in treating diseases of the membranes when a stimulating, mild antiseptic is required.

In a compound ointment combining astringent and drying properties with its antiseptic and stimulating effect it is useful in eczemas and in certain cases of hemorrhoids.

The vapor may be inhaled direct from a generator or indirectly mixed with air.

The liquid may be applied to wounds in its strongest form.

SOME EFFECTS OF STORAGE ON COFFEE[1]

By R. E. Doolittle and Burnett B. Wright.

This investigation was undertaken for the purpose of determining the effect of storage on the gain or loss in weight of freshly roasted coffee, prepared, transported and stored under ordinary commercial conditions. During the latter part of the month of July, 1913, 847 packages, each containing exactly one pound of freshly roasted coffee, were packed and distributed in the following manner: One hundred and sixty-eight packages to New Orleans, La., by the Southern Pacific Steamship Co., 168 packages to Chicago by railroad, 168 packages to Denver by railroad, 343 packages stored in an unheated warehouse in New York City. The 168 packages shipped to New Orleans, Chicago and Denver were identical with the 343 packages reserved in New York and consisted of medium roasted Santos coffee. Seventy-two packages in each instance were paper bags with paraffine paper lining, 36 of which contained the coffee in the whole bean and 36 in the medium ground condition. Seventy-two packages were cardboard cartons inclosing a paraffine paper bag, 36 of which were filled with the roasted beans and 36 with the medium ground coffee. Twenty-four packages were tin cans, 12 of which contained the whole beans and 12 the medium ground coffee. The packages shipped to New Orleans, Chicago and Denver were reweighed immediately on reaching their destination and approximately every two weeks thereafter until the month of December, 1913, after which they were weighed once each month. Similar weighings were made on the samples stored in New York City.

The results are well illustrated in a chart prepared from the data obtained on the samples stored in New York City.

It was noted in the first place that there was an increase over the original weight in all samples and at all weighings. The paper bags and pasteboard cartons show a very rapid increase at first, the maximum for the first 12 months being reached within 14 weeks. As would be expected, the coffee contained in the cardboard cartons absorbs moisture a little slower than that in the paper bags but, in general, the results on these two forms of packages show very uniform changes throughout the experiment. In the case of the tin

[1] Paper read at the 19th annual convention of the Association of American Dairy, Food and Drug Officials, at Berkeley, Cal., Aug. 2–5, 1915.

can packages it was noted that, while there is an increase in weight, this increase is much slower and more uniform and the maximum is not reached within a year; in fact, the maximum has probably not been reached in the period covered by this experiment, namely, 60 weeks.

Comparison of the curves for the whole and ground coffees show that in most cases there was a greater increase in weight in the whole beans than in the ground coffee. It was found in the course of the investigation, however, that the paper bags became saturated with the oil from the coffee and the cartons partially saturated. This condition, undoubtedly, affected the tare of the containers and thereby influenced the results in some cases. Furthermore, this oil, by clogging the pores of the containers and preventing the easy passage of the moisture to a certain extent, may have effected the change; also the oil if easily volatilized would give a further loss in weight. This may account for the difference between the whole and ground coffee in the paper bags and the cardboard cartons. This condition, of course, did not occur in the case of the tin can packages.

The seasonal changes are also interesting. It was noted in the paper bags and cartons the maximum increase in weight was reached in the Fall months, namely, September and October. During the Winter months there is a loss from the weight during the Fall months, while during the Spring and Summer there is very little change, the rise beginning in the late Summer and Fall. Apparently the coffee in the sealed tin cans is not greatly affected by the varying moisture conditions of the different seasons. We have not in this paper attempted to plot the curves showing the variations between the samples held at Chicago, New Orleans, Denver and New York. It may be stated, however, that the changes at New York, Chicago and New Orleans were very similar, the principal difference being in the percentage of increase. The results at Denver show some variation from those of the other cities, particularly the paper bags and cardboard carton packages. This is illustrated in the chart given in the original paper for the ground samples.

It was noted that the coffee in the tins at Denver shows a similar change to that of the other cities, namely, a gradual increase. This increase, however, is much slower. In the paper bags and the cartons there was a rapid increase at the first weighing, which weighing was made on the arrival of the coffee at Denver and, therefore, in reality covers the period of transportation. This is followed by loss after which these two forms of packages show a very uniform

weight throughout the period covered by the experiment. The seasonal changes, while similar to those of the other cities, are not so marked.

Many other interesting facts might be pointed out, but it is not the intent of this paper to go into an exhaustive discussion of the data obtained. We have only attempted to bring to your attention a few of the more interesting facts and leave a fuller discussion of the report for some later paper.

EFFECT OF STORAGE ON MOISTURE CONTENT OF CLOVES.[1]

By A. W. Ogden.

A spice merchant charged with misbranding under the Food and Drugs Act of June 30, 1906, for the sale of short weight cloves, alleged that the shortage was due to natural causes and that a loss of 15 to 18 per cent. in weight of whole cloves in a few days was not unusual. To determine the effect of storage on the weight of whole cloves, a number of samples were taken from original unbroken bales after arrival in this country and stored in ordinary wooden spice boxes in a dry storeroom in New York City. Gross weighings were made at intervals and as these showed a gradual loss the experiment was continued and careful net weighings were made after periods of six months and 54 months. Below are given the analyses and the average losses for periods specified:

Table of Analyses

No.	Moisture %	Ash: Total %	Ash: Insoluble in 10 per cent. HCl %	Ether extracts: Volatile %	Ether extracts: Non-volatile %	Loss in weight: 6 months %	Loss in weight: 54 months %
1.....	8.17	7.27	0.20	15.16	6.54	5.81	7.83
2.....	10.76	5.93	0.10	18.71	5.47	4.40	7.05
3.....	8.01	5.79	0.10	18.63	5.42	0.25	2.50
4.....	9.31	5.75	0.09	19.10	5.40	1.10	3.31
5.....	8.91	5.59	0.09	19.34	5.20	2.64	4.96
6.....	7.43	6.13	0.08	19.67	5.45	1.25	3.50
7.....	7.81	5.98	0.08	18.51	5.46	1.50	3.75
Minimum...	7.43	5.59	0.08	15.16	5.20	0.25	2.50
Maximum...	10.76	7.27	0.20	19.67	6.54	5.81	7.83
Average.....	8.63	6.06	0.11	18.45	5.56	2.42	4.70

[1] Paper read at 19th annual convention of the Association of American Dairy, Food and Drug Officials, at Berkeley, Cal., Aug. 2–5, 1915.

The wooden boxes used were of two sizes, viz., 4 x 4⅝ x 6 inches and 6¼ x 7 x 8⅝ inches, the smaller holding about one pound, and the larger about four pounds of whole cloves.

All duplicates showed close agreements, except No. 2, which, for the six months' period, lost 3.95 and 4.85 per cent., and for the 54 months' period 6.83 and 7.27 per cent., respectively.

It is noted in the analysis of this sample that the moisture was 10.76 per cent., which is 2.75 per cent. higher than No. 3, which in 54 months showed a loss of only 2½ per cent. Both of these lots, as well as No. 4, were shipped from London and arrived in this country on the same steamer.

Nos. 1, 5 and 7 were shipped from Zanzibar and No. 6 from Rotterdam, all arriving about the same time, although on different steamers.

Eight separate determinations were made on sample No. 1, part of them in one-pound boxes and part in four-pound boxes, in which, however, only two pounds of cloves were placed.

The average loss on all samples for the six months' period was 2.42 per cent. and for the 54 months' period 4.70 per cent., and the maximum loss for this period was 7.83 per cent.

CORRESPONDENCE.

Cultivation of Medicinal Plants.

The Editor,

American Journal of Pharmacy,

145 North Tenth Street, Philadelphia, Pa.

Dear Sir:

We have just been reading an article on the "Cultivation of Medicinal Plants," by Dr. Fred. B. Kilmer, in your August issue, which has been brought to our notice, and we have read this article with considerable interest.

Many of the facts put forward by Dr. Kilmer we agree with, but we must very strongly dissent from some of the remarks referring to English growers of medicinal plants. On page 345 he says (referring to our firms among others) "that English growers carefully prepare the leaves of Digitalis, Henbane, Belladonna and sell to the American buyers at high prices, and the portion of the plants which the Americans reject, they make into extracts and other compounds for home consumption."

In our experience, this statement is calculated to give a completely wrong impression. We have found that English and American buyers are equally particular in their purchases of such articles as Belladonna, Henbane, etc. By far the larger portion of the output of selected English medicinal leaves is purchased by English houses, and the amount taken by American consumers is very small. From what we have always been led to understand, American buyers have been accustomed to fill the majority of their needs from German or other sources.

As we feel that Dr. Kilmer's statement is somewhat a reflection on our houses, we trust you will see your way to publish this in the next issue of your journal.

We are, yours truly,
For Wm. Ransom & Son, Ltd.,
FRANCIS RANSOM,
Director.
For Stafford Allen & Sons, Ltd.,
KENNETH E. ALLEN,
Director.

August 18, 1915.

Mr. Henry Kraemer, Editor,
AMERICAN JOURNAL OF PHARMACY,
145 North Tenth Street, Philadelphia, Pa.

DEAR MR. KRAEMER:

I have read with interest the letter of Stafford Allen & Sons, Ltd., London, England, in reference to my paper on the "Cultivation of Medicinal Plants." The phraseology to which they refer was not intended as a reflection upon Stafford Allen & Sons, whose products are well known and whose reputation and integrity are unquestioned.

The point which I intended to make was that the English and Continental growers are enabled to utilize all portions of the plant, while we, being restricted by our Pharmacopœia and trade customs, are limited to certain portions of the plants. For example, with Digitalis we are at the present time restricted to the leaves from plants of the second year's growth at the commencement of flowering. In Hyoscyamus the Pharmacopœia requires only the dry leaves of the flowering tops collected from plants of the second year's growth. In Belladonna the Pharmacopœia recognizes the leaves and the root.

Therefore, buyers, American or otherwise, must pay high prices for these selections. Further than this it is a well-known fact that in the so-called "selected leaves" they must be gathered at a time when the leaves are most succulent, which is a period at which they are not the most active. In other words, the English and Continental grower can sell on the basis of looks, and he is wise enough to use the less sightly portions as well as other parts of the plant in other ways. The problem is one which confronts drug growers in the United States to-day. In respect to Digitalis, it has been shown that the first year's leaves are fully as active as, and sometimes more active than, the second year's growth, and in a measure the same holds true in regard to Hyoscyamus.

The question is, What will the grower do with his first year's growth, and with the stem and other parts of the plant?

If the first year's growth is to be discarded, and if in the second year's growth only the leaves can be used, the cost of cultivation will be prohibitive. I have in mind a considerable acreage of Belladonna which is just ready to be harvested; the leaves, to meet the requirements, must be free from stems. The stems, flowering tops, and other portions of the plant, except the root, cannot be sold as a drug meeting the requirements of the Pharmacopœia. In other words, less than seventy-five per cent. of the yield is usable for Pharmacopœia preparations.

In brief, I intended to point out that we should follow the example of the cultivators in other lands—be able to utilize the whole of the plant, and thus avoid paying a high price for only selected portions, especially when "selections" does not always mean high alkaloidal assay.

Very truly yours,

F. B. KILMER.

Sept. 1, 1915.

BOOK REVIEWS.

THE PHARMACOLOGY OF USEFUL DRUGS. By Robert A. Hatcher, Professor of Pharmacology, Cornell University Medical College, New York, and Martin I. Wilbert, Technical Assistant, Division of Pharmacology, Hygienic Laboratory, U. S. Public Health Service. Chicago: American Medical Association, 535 North Dearborn Street, 1915.

This book of 457 small 8vo pages embodies a discussion in popu-

lar form, of the pharmacology, the chief therapeutic uses, and the materia medica of those drugs which have been accepted by the Council on Pharmacy and Chemistry of the American Medical Association for inclusion in the "Handbook of Useful Drugs."

As a contribution to the propaganda for a rational material medica this volume is deserving of careful study on the part of pharmacists as well as physicians. As has been pointed out before, the list of "Useful Drugs" includes all of the well-established and widely-used drugs and preparations now included in the Pharmacopœia of the United States, with a number of the newer products not as yet included in that standard.

As suggested by the title, the object of this book is to make it clear to medical practitioners that the well-known and more widely-used drugs of our materia medica fully suffice to meet all known pharmacologic requirements. The book is not intended to replace the larger works on pharmacology and therapeutics, but rather to act as a stimulus and to serve as a guide to the more comprehensive treatises.

A LIST OF MISCELLANEOUS PUBLICATIONS OF THE UNITED STATES PUBLIC HEALTH SERVICE announces for free distribution Hygienic Laboratory Bulletin No. 104, "The Digest of Comments on the Pharmacopœia of the United States of America and on the National Formulary for the Calendar Year ending December 31, 1914." Application for this publication should be made to the "Surgeon-General, United States Public Health Service, Washington, D. C.," and should specify both the title and number of the document desired. No charge is made for postage. As the number of copies of this bulletin available for free distribution is limited, readers of this journal who may be interested should apply promptly so as to insure the distribution of the publication to those who will find it of use and value.

PROGRESS IN APPLIED SCIENCE.

COAL-TAR DYESTUFF INDUSTRY.

"There is still, however, one serious obstacle in the way of the confident and determined development of the coal-tar dyestuff industry on American soil, and that difficulty is the possibility, no, rather the certainty, that upon the resumption of normal international conditions European manufacturers will endeavor, by boycott, under-

selling, and other methods of competition, to win back this profitable market and put out of business a new and struggling dyestuff industry."

This statement was made before the Society of Chemical Industry, in session in New York, October 22, by Dr. Edward Ewing Pratt, Chief of the Bureau of Foreign and Domestic Commerce, in his address on the subject, "Do We Want a Coal-tar Chemical Industry?" Dr. Pratt pointed out the efficient organization of the European coal-tar dyestuff industry, and particularly the German industry. He stated that "the German coal-tar chemical industry is probably the most highly and completely organized industry in the world. The industry involves not only complex chemical processes, but elaborate and expensive plants. It requires the services of thousands of scientifically-trained chemists and vast armies of workers. Not less highly organized is the commercial end of the business, devoted to merchandizing the products of the twenty-two dyestuff factories manufacturing in Germany. Commercially, the coal-tar chemical industry of Germany is a unit. Prices, terms, conditions of sales, market competition, and export policies are determined and fixed by the industry as a whole.

"Up to the present time there has been no serious competition with the foreign coal-tar chemical industry. Any attempt to seriously dispute its dominance in other countries is persistently checked and prevented by the united action of European producers, by underselling and boycotts. Of the world's production of coal-tar dyes, valued at $92,150,000, Germany produced $68,300,000 worth, or practically three-fourths of the world's supply. Of the world's export trade, Germany has an even larger share, taking for herself over 88 per cent."

Dr. Pratt pointed out that the United States has the raw materials, the markets, the technical skill, and the capital to develop this new industry, but he went on to cite specific examples of how the coal-tar chemical industry in this country has been throttled, and he cited an example of a company which had been organized in the State of New York "for the manufacture of organic and inorganic chemicals and its homologues and by-products. Although this company started with a capital of approximately only one-tenth of the United States' consumption, the European convention immediately announced its intention of putting us out of business as promptly as possible by underselling, regardless of costs. Accordingly, it at once cut the regular net delivery market price of its

exports to this country from $10^9/_{10}$ cents per pound to $9^9/_{10}$ cents per pound, and made secret contracts for sales in large quantities at far lower prices. Similar reductions in price had not taken place in other countries, the reduction here being made in the face of world-wide advance in the price of materials entering into the manufacture of aniline oil, in addition to the well-known advance in the labor involved in its production.

"Another American dyestuff concern reports a considerable list of colors, continued manufacture of which was rendered commercially impossible by the prolonged underselling on the part of foreign competitors at rates below the ordinary market prices of the wares in question."

After pointing out the serious effects of the European war upon the supply of dyestuffs furnished to this country, and the practical dyestuff famine which has occurred in this country, Dr. Pratt mentioned specifically not only the increase which has taken place in the production of dyestuffs by factories in existence prior to the war, but the fact that numerous new plants have been established.

"Five domestic concerns manufacturing dyestuffs have doubled their output. Another factory, the branch of a large German firm, has greatly increased its output. Still another factory manufacturing aniline has quadrupled its output.

"The great demand for dyestuffs has brought many new concerns into the field. There are now nine new plants making aniline and intermediates. Their total output is 18,000 pounds daily. One new plant for manufacturing dyestuffs, capitalized at $2,000,000, is now in existence and is producing at the rate of 1000 pounds daily. Another plant will be ready for operation about November 1. Another company, capitalized at $15,000,000, has started plans for extensive works in different parts of the country.

"Our total production of coal-tar dyestuff materials at the present moment is probably over three times the production prior to the European war. In July, 1914, we were saving a scant 10 per cent. of the coke by-products by means of by-product recovery coke plants. To-day we are saving not less than 20 per cent.

"This matter has been thoroughly discussed by the officials of the Department of Commerce and the Federal Trade Commission, and they have agreed substantially on these points, namely:

"1. That foreign concerns should be permitted to exercise no privileges in this country or against concerns in this country which are prohibited to domestic concerns. In other words, what we call

unfair competition shall not be permitted any more to foreign concerns than to domestic concerns.

"2. That this or any new industry which aims to place us in an independent position industrially among the nations of the world shall be given a fair chance."

Dr. Pratt then raised the question of exactly how this was to be accomplished, by what methods, and by what legislation. He emphasized the idea that the legislation should be rather against the unfair competition than in the nature of tariff legislation, and instanced the experience of Canada, South Africa, and Australia on these points.

He concluded with the following statement:

"It is our desire that the United States shall have independent and self-sufficing industries. I hope that the time has arrived when we can cast off industrial, commercial, or financial allegiance to any nation or any group of nations. I hope that the time has arrived when we can do away with our industrial crutches. I hope that the time has arrived when we can go forward into the world's markets, man for man, industry for industry, and compete fairly and squarely at home and abroad, AND WIN."

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE SEMI-ANNUAL MEETING.

The semi-annual meeting of the Philadelphia College of Pharmacy was held September 27, 1915 at 4 P.M., in the library. Eighteen members were present.

The minutes of the quarterly meeting held June 28 were read and approved. The minutes of the Board of Trustees for June 1 and July 20 were read by the Registrar, J. S. Beetem, and approved.

Committee on Nominations reported the list of nominees for vacancies in the Board of Trustees.

Mr. J. W. England, for the delegates to the meeting of the American Pharmaceutical Association held at San Francisco, August 9–14, made a lengthy report, which was referred for publication (see AMERICAN JOURNAL OF PHARMACY, October, 1915, pp. 483–488).

ELECTION OF TRUSTEES.—The President appointed Messrs. Stiles, Stroup, and Strawinski as tellers. While the ballots were being counted other business was transacted.

Professor Kraemer dwelt at length on the possibilities of making the museum a centre of attraction to the pharmacists and the public, and advocated an entire change in the display of specimens. He proposed displaying the historical relics and records now in possession of the College, making certain special exhibits, as of opium, cinchona, etc., and securing packages and containers used in the importation of drugs in large quantities. The large assortment of old mortars should be properly labelled and exhibited. Various processes in pharmacy should also be shown, and in view of the meeting of the American Pharmaceutical Association at Atlantic City next year, it should be a rally year for all the alumni and those interested in the progress of pharmacy.

Mr. French appreciated the suggestions of Professor Kraemer, as also did Mr. England, who hoped the suggestions would be carried out, and after further remarks by Mr. French and Professor Kraemer the subject was referred to the Committee on Museum and Herbarium.

The Tellers reported the result of the election, when the President announced that Samuel C. Henry, O. W. Osterlund, and Aubrey H. Weightman were reelected to membership in the Board of Trustees for the ensuing three years.

The President appointed Professor Henry Kraemer, O. W. Osterlund, and Richard H. Lackey as the Committee on Membership, with the Treasurer and Recording Secretary members *ex officio*.

Mr. George M. Beringer submitted the following: "The Philadelphia College of Pharmacy extends to Mr. Frederick Gutekunst, one of her honored graduates, its sincere congratulations on his rounding out the 84th milestone of his busy life, and expresses the sincere hope that the year he is now entering upon may be one of unusual happiness and prosperity, and that many more years may be added to his successful career." It was unanimously voted that the Secretary forward to Mr. Gutekunst this expression of good-will from the College.

Mr. E. M. Boring reported the recent death of Mrs. Jennie McIntyre, widow of our late fellow-member, William McIntyre, for many years actively identified with the College.

Professor Remington reported some of the transactions of the Conference of Pharmaceutical Faculties at the recent meeting held at San Francisco.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

June 1st, 1915.—Fifteen members were present. The Committee on Supplies reported having received estimates from several firms for microscopes. It was ordered that the committee be authorized to purchase microscopes with the approval of Professor Kraemer. The committee further reported that it has the opportunity of advantageously purchasing a projecting lantern. The committee was given power to act.

Committee on Instruction had expected to present a report covering the proposed Roster for 1915–16, but, owing to the amount of work involved, the committee would have to ask further indulgence, which request was granted. The regular order of business was suspended and the report of the Committee on Instruction, as presented at the meeting in May, was again considered. The various recommendations of the committee were taken up *seriatim:*

First.—Recommending the establishment of a two years' course and the Ph.G. Degree, which, after a prolonged and animated discussion, was adopted.

Second Recommendation.—Post-graduate course, one year, and the degree of Phar.D., entrance requirements sixty counts. Adopted.

Third Recommendation.—The course leading to the degree of Pharmaceutical Chemist (P.C.) as now given be discontinued after students now matriculated for the course complete it. Adopted.

Fourth Recommendation.—Post-graduate course—two years—leading to the degree of B.S. be established. Amended, "subject to the opinion of counsel," and adopted.

Fifth, Sixth, and Seventh Recommendations, relating to details connected with the courses, adopted.

Eighth and Ninth Recommendations, relating to fees, adopted.

On motion it was voted that the Board express its appreciation of the work of the Committee on Instruction.

Amendment to the By-Laws.—The amendments to Article VIII proposed previously, relating to the necessary changes caused by the adoption of the new courses, were then adopted.

Committee on Examinations presented the names of the candidates for the degree of Doctor in Pharmacy (P.D.). A vote being taken and the ballot clear, the Chair declared the candidates entitled to receive the degree P.D.

The names of those entitled to receive the degree of Pharmaceutical Chemist (P.C.) were then presented, balloted for, and approved. The committee also announced the names of those to whom prizes were to be awarded, as also those entitled to honorable mention.

The Chairman announced the names of those members of the Board and others who would present the prizes on the evening of the Commencement. The Chairman announced that Professor Sadtler requested permission to withdraw from the Committee on Announcement, which was granted. The Chair then appointed Mr. George B. Evans to fill the vacancy.

July 20th, 1915.—Special meeting. Mr. French, chairman of the Committee on Finance, made a report for the committee and then moved that E. Fullerton Cooke be elected to an Associate Professorship and his title be Associate Professor of Pharmacy. It was adopted. The question of Professor Cooke being instructor in commercial training, and how his name should appear in the Bulletin, was discussed, and it was decided that his name should appear as Associate Professor in Pharmacy, and also as Instructor in Commercial Training.

CHEMICAL CONSTITUTION AND PHYSIOLOGICAL ACTION.

There has been published recently by D. Van Nostrand Company, New York, a translation of Prof. Leopold Spiegel's work on the "Chemical Constitution and Physiological Action." The action of chemical agents upon animal organism, and particularly upon man, is of the greatest importance and interest. Far too little has been done toward systematizing our knowledge of this subject, and there is no doubt that this field offers an enormous opportunity for useful research. The purpose and scope of the present treatise have seemed of sufficient importance to justify its translation. The translators, Dr. Leudeking and A. C. Boylston, have brought the work up to date. The relation between chemical constitution and physiological action is of such fundamental and far-reaching significance that this work should be of very great interest not only to physiological chemists and physicians but to manufacturing pharmacists. For real, rational scientific medicine must be founded upon a knowledge of this subject, and in order that a steady progress shall be made, a systematic knowledge must replace haphazard and empirical information.